

Claims

- [c1] 1.A method for reducing line edge roughness (LER) of a semiconductor gate structure, the method comprising:
patterning a photoresist layer formed over an oxide hardmask layer;
etching said photoresist layer so as to transfer a photoresist pattern to said oxide hardmask layer, said photoresist pattern having an initial LER;
etching exposed surfaces of said oxide hardmask with a chemical oxide removal (COR) so as to form a reaction product on said exposed surfaces;
wherein concave portions of said exposed surfaces are etched at a reduced rate with respect to convex portions of said exposed surfaces.
- [c2] 2.The method of claim 1, wherein said COR is implemented by reacting said oxide hardmask with HF and ammonia gasses.
- [c3] 3.The method of claim 2, wherein said oxide hardmask comprises a tetraethyl orthosilicate (TEOS) layer.
- [c4] 4.The method of claim 2, wherein said reaction product further comprises ammonium hexafluorosilicate.

- [c5] 5.A method for forming a gate structure for a semiconductor device, the method comprising:
patterning a photoresist layer formed over an oxide hardmask layer, said oxide hardmask layer formed over a gate conductor layer;
etching said photoresist layer so as to transfer a photoresist pattern to said oxide hardmask layer;
reducing an initial line edge roughness (LER) of said oxide hardmask layer; and
etching the gate structure using said oxide hardmask layer;
wherein said reduced initial LER is transferred to the gate structure.
- [c6] 6.The method of claim 5, wherein said reducing an initial LER further comprises etching exposed surfaces of said oxide hardmask with a chemical oxide removal (COR) so as to form a reaction product on said exposed surfaces, wherein concave portions of said exposed surfaces are etched at a reduced rate with respect to convex portions of said exposed surfaces.
- [c7] 7.The method of claim 6, wherein said COR is implemented by reacting said oxide hardmask with HF and ammonia gasses.

- [c8] 8.The method of claim 7, wherein said oxide hardmask comprises a tetraethyl orthosilicate (TEOS) layer.
- [c9] 9.The method of claim 7, wherein said reaction product further comprises ammonium hexafluorosilicate.
- [c10] 10.A method for reducing line edge roughness of an oxide structure, the method comprising:
etching exposed surfaces of the oxide structure with a chemical oxide removal (COR), wherein said COR is implemented by reacting the oxide material with HF and ammonia gasses so as to form a reaction product on said exposed surfaces;
wherein concave portions of said exposed surfaces are etched at a reduced rate with respect to convex portions of said exposed surfaces.
- [c11] 11.The method of claim 10, wherein said oxide structure comprises tetraethyl orthosilicate (TEOS).
- [c12] 12.The method of claim 10, wherein said reaction product further comprises ammonium hexafluorosilicate.